Claim Amendment

Applicants hereby provisionally elect the invention of Group I, Claims 25-43, 50 and 51, for further prosecution on merits. Please withdraw Claims 44-49 as drawn to non-elected inventions.

The Claim Listing below will replace all prior versions of the claims in the application:

Claim Listing

1-24 (Cancelled)

25. (Previously presented) A proton-conducting polymer membrane comprising polymers containing sulfonic acid groups, prepared by a process comprising the steps of

a) mixing vinyl-containing sulfonic acid with one or more aromatic tetraamino compounds with one or more aromatic carboxylic acids, their esters, their acid halides or their acid anhydrides, containing at least two acid groups per carboxylic acid monomer, or mixing vinyl-containing sulfonic acid with one or more aromatic or heteroaromatic diaminocarboxylic acids, their esters, their acid halides or their acid anhydrides,

b) heating the mixture prepared according to step a) under inert gas to temperatures of up to 350°C, to form polyazole polymers,

c) applying a layer to a support, using the mixture according to step a) or step b),

d) polymerizing the vinyl-containing sulfonic acid present in the sheetlike structure prepared according to step c).

26. (Previously presented) The membrane of Claim 25, characterized in that as aromatic tetraamino compounds 3,3',4,4'-tetraaminobiphenyl, 2,3,5,6-tetraaminopyridine, 1,2,4,5-tetraaminobenzene, 3,3',4,4'-tetraaminodiphenyl sulfone, 3,3',4,4'-tetraaminodiphenyl ether, 3,3',4,4'-tetraaminobenzophenone, 3,3',4,4'-tetraaminodiphenyl methane and 3,3',4,4'-tetraaminodiphenyldimethyl methane is used.

27. (Previously presented) The membrane of Claim 25, characterized in that as aromatic carboxylic acids isolphthalic acid, terephthalic acid, phthalic acid, 5-hydroxyisophthalic acid, 4-hydroxyisophthalic acid, 2-hydroxyterephthalic acid, 5-aminoisophthalic acid, 5-N,N-dimethylaminoisophthalic acid, 5-N,N-diethylaminoisophthalic acid, 2,5-dihydroxyterephthalic acid, 2,5-dihydroxyisophthalic acid, 2,3-dihydroxyisophthalic acid, 2,3-dihydroxyphthalic acid, 2,4-dihydroxyphthalic acid, 3,4-dihydroxyphthalic acid, 3-fluorophthalic acid, 5-fluoroisophthalic acid, 2-fluoroterephthalic acid, tetrafluorophthalic acid, tetrafluoroisophthalic acid, tetrafluoroterephthalic acid, 1,4-napthalenedicarboxylic acid, 1,5-naphthalenedicarboxylic acid, 2,6-naphthalenedicarboxylic acid, 2,7-naphthalenedicarboxylic acid, diphenic acid, 1,8-dihydroxynaphthalene-3,6-dicarboxylic acid, diphenyl ether 4,4'-dicarboxylic acid, benzophenone-4,4'-dicarboxylic acid, diphenyl sulfone 4,4'-dicarboxylic acid, biphenyl-4,4'-dicarboxylic acid, 4-trifluoromethylphthalic acid, 2,2-bis(4-carboxyphenyl)hexafluoropropane, 4-4'-stilbenedicarboxylic acid, 4-carboxycinnamic acid, or their C1-C20 alkyl esters, their C5-C12 aryl esters, their acid anhydrides, or their acid chlorides are used.

28. (Previously presented) The membrane of Claim 25, characterized in that as aromatic carboxylic acid tricarboxylic acids, their C1-C20 alkyl esters, their C5-C12 aryl esters, their acid anhydrides, or their acid chlorides or tetracarboxylic acids, their C1-C20 alkyl esters, their C5-C12 aryl esters, their acid anhydrides or their acid chlorides are used.

29. (Previously presented) The membrane of claim 28, characterized in that the aromatic carboxylic acid used includes at least one member of the group consisting of 1,3,5-benzenetricarboxylic acid (trimesic acid); 2,4,5-benzenetricarboxylic acid (trimellitic acid); (2-carboxyphenyl)iminodiacetic acid, 3,5,3'-biphenyl-tricarboxylic acid; 3,5,4'-biphenyltricarboxylic acid; 2,4,6-pyridinetricarboxylic acid; benzene-1,2,4,5-tetracarboxylic acids; naphthalene-1,4,5,8-tetracarboxylic acids; 3,5,3',5'-biphenyltetracarboxylic acids; benzophenonetetracarboxylic acid; 3,3',4,4'-

biphenyltetracarboxylic acid; 2,2',3,3'-biphenyltetracarboxylic acid; 1,2,5,6-naphthalenetetracarboxylic acid; and 1,4,5,8-napththalenetetracarboxylic acid.

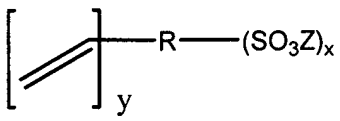
30. (Previously presented) The membrane of Claim 28, characterized in that the amount of tricarboxylic acid or tetracarboxylic acids is between 0 an 30 mol% based on dicarboxylic acid used.

31. (Previously presented) The membrane of Claim 25, characterized in that the heteroaromatic carboxylic acids, heteroaromatic dicarboxylic acids, heteroaromatic tricarboxylic acids, or heteroaromatic tetracarboxylic acids contain at least one nitrogen, oxygen, sulfur, or phosphorus atoms in the aromatic moiety.

32. (Previously presented) The membrane of Claim 31 characterized in that pyridine-pyridine-2,5-di-carboxylic acid, pyridine-3,5-dicarboxylic acid, pyridine-2,6-dicarboxylic acid, pyridine-2,4-dicarboxylic acid, 4-phenyl-2,5-pyridinedicarboxylic acid, 3,5-pyrazoledicarboxylic acid, 2,6 pyrimidinedicarboxylic acid, 2,5-pyrazine-dicarboxylic acid, 2,4,6-pyridinetricarboxylic acid, benzimidazole-5,6-di-carboxylic acid, and their C1-C20 alkyl esters, their C5-C12 aryl esters, their acid anhydrides, or their acid chlorides are used.

33. (Previously presented) The membrane of Claim 25, characterized in that as aromatic diaminocarboxylic acid diaminobenzoic acid or the mono- and dihydrochloride derivatives thereof are used.

34. (Previously presented) The membrane of Claim 25, characterized in that the mixture prepared in step A) comprises compounds of the formula



in which

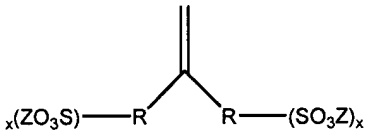
R is a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted in turn by halogen, -OH, COOZ, -CN, NZ_2,

Z independently at each occurrence is hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted in turn by halogen, -OH, -CN, and

x is an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10,

y is an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

or the formula



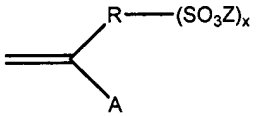
in which

R is a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted in turn by halogen, -OH, COOZ, -CN, NZ_2,

Z independently at each occurrence is hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group, or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted in turn by halogen, -OH, -CN, and

x is an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10,

or the formula



in which

A is a group of the formulae $COOR^2$, CN, $CONR^2_2$, OR^2 or R^2, in which R^2 is hydrogen, a C1-C15 alkyl group, C1-C15-alkoxy group, ethyleneoxy group or

C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted in turn by halogen, -OH, COOZ, -CN, NZ_2,

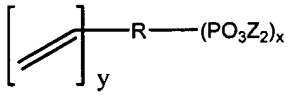
R is a bond, a divalent C1-C15 alkylene group, divalent C1-C15 alkyleneoxy group, such a divalent ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted in turn by halogen, -OH, COOZ, -CN, NZ_2,

Z independently at each occurrence is hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted in turn by halogen, -OH, -CN, and

x is an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.

35. (Previously presented) The membrane of claim 25, characterized in that the mixture prepared in step A) or step B) comprises vinyl-containing phosphonic acid.

36. (Previously presented) The membrane of claim 35, characterized in that the mixture prepared in step A) or step B) comprises compounds of the formula



in which

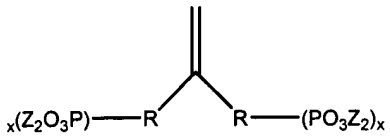
R is a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted in turn by halogen, -OH, COOZ, -CN, NZ_2,

Z independently at each occurrence is hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted in turn by halogen, -OH, -CN and

x is an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10,

y is an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

or of the formula



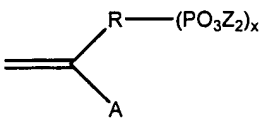
in which

R is a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted in turn by halogen, -OH, COOZ, -CN, NZ_2,

Z independently at each occurrence is hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 ary or heteroaryl group, wherein the above radicals are optionally substituted in turn by halogen, -OH, -CN, and

x is an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10,

or of the formula



in which

A is a group of the formulae $COOR^2$, CN, $CONR^2_2$, OR^2 or R^2, in which R^2 is hydrogen, a C1-C15 alkyl group, C1-C15-alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted in turn by halogen, -OH, COOZ, -CN, NZ_2,

R is a bond, a divalent C1-C15 alkylene group, divalent C1-C15 alkyleneoxy group, such as ethyleneoxy group or divalent C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted in turn by halogen, -OH, COOZ, -CN, NZ_2,

Z independently at each occurrence is hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted in turn by halogen, -OH, CN, and

x is an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.

37. (Previously presented) The membrane of Claim 34, characterized in that the weight ratio of vinyl-containing phosphonic acid to vinyl-containing sulfonic acid is in the range from 1:100 to 99:1.

38. (Previously presented) The membrane of Claim 25, characterized in that in step D) monomers capable of crosslinking which contain at least two carbon-carbon double bonds are polymerized.

39. (Previously presented) The membrane of Claim 25, characterized in that the polymerization according to step D) is brought about by means of a free radical initiator.

40. (Previously presented) The membrane of Claim 25, characterized in that the polymerization according to step D) takes place by irradiation of IR or NIR light, UV light, β, γ or electron beams.

41. (Previously presented) The membrane of Claim 25, characterized in that the mixture produced in step A) or step B) comprises dissolved, dispersed or suspended polymer.

42. (Previously presented) The membrane of Claim 25, characterized in that in step C) a layer having a thickness between 20 and 4000 μm is produced.

43. (Previously presented) The membrane of claim 25, characterized in that the membrane formed after step D) has a thickness of between 15 and 3000 μm.

44. (Withdrawn) An electrode having a proton-conducting polymer coating based on polyazoles prepared by a process comprising the steps of

A) mixing one or more aromatic tetraamino compounds with one or more aromatic carboxylic acids, their esters, their acid halides or their acid anhydrides, containing at least two acid groups per carboxylic acid monomer, or mixing one

or more aromatic or heteroaromatic diaminocarboxylic acids, their esters, their acid halides or their acid anhydrides, and with vinyl-containing sulfonic acid,

B) heating the mixture prepared according to step A) under inert gas to temperatures of up to 350°C, to form polyazole polymers,

C) applying a layer to an electrode, using the mixture according to step A) or B), and

D) polymerizing the vinyl-containing sulfonic acid.

45. (Withdrawn) The electrode of claim 44, wherein the coating has a thickness of between 2 and 3000 μm.

46. (Withdrawn) The electrode of claim 45, wherein the coating has a thickness of between 5 and 1500 μm.

47. (Withdrawn) A membrane electrode assembly comprising at least one electrode and at least one membrane of Claim 25.

48. (Withdrawn) A membrane electrode assembly comprising at least one electrode of Claim 44 and at least one proton-conducting polymer membrane that includes polymers containing sulfonic acid groups and are prepared by a process comprising the steps of

a) mixing vinyl-containing sulfonic acid with one or more aromatic tetraamino compounds with one or more aromatic carboxylic acids, their esters, their acid halides or their acid anhydrides, containing at least two acid groups per carboxylic acid monomer, or

mixing vinyl-containing sulfonic acid with one or more aromatic or heteroaromatic diaminocarboxylic acids, their esters, their acid halides or their acid anhydrides,

b) heating the mixture prepared according to step a) under inert gas to temperatures of up to 350°C, to form polyazole polymers,

c) applying a layer to a support, using the mixture according to step a) or step b),

d) polymerizing the vinyl-containing sulfonic acid present in the sheetlike structure prepared according to step c).

49. (Withdrawn) A fuel cell comprising one or more membrane electrode assemblies of Claim 47.

50. (Previously presented) A process for producing proton-conducting polymer membranes comprising polymers containing sulfonic acid groups which comprises the steps of

A) mixing one or more aromatic tetraamino compounds with one or more aromatic carboxylic acids, their esters, their acid halides or their acid anhydrides, containing at least two acid groups per carboxylic acid monomer, or mixing one or more aromatic or heteroaromatic diaminocarboxylic acids, their esters, their acid halides or their acid anhydrides, and with vinyl-containing sulfonic acid,

B) heating the mixture prepared according to step A) under inert gas to temperatures of up to 350 °C, to form polyazole polymers,

C) applying a layer to a support, using the mixture according to step A) or B),

D) polymerizing the vinyl-containing sulfonic acid.

51. (Previously presented) The membrane of claim 35, wherein the mixture of polyazole polymers, polyvinyl sulfonic acid-containing polymers and polyvinyl phosphonic acid-containing polymers forms an interpenetrating network.